

SATYEN BOSE : A LIFE

MELVYN BROWN



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This book is dedicated
to
the many people who came forward to
assist me in the preparation of
this Biography without whose
help this book would not
have been possible

INTRODUCTION

**Satyendra Nath Bose. What a personality to recall !
What a personage to write about ! Indeed, what an example
set forth to all readers of this book !**

**His face is familiar to many if not as celebrated as that
of Bhabha, Haldane, C. R. Rao and C. V. Raman, to men-
tion just a few of our great scientists. And although the
headline name of yesterday is sometimes lost ; Satyen
Bose, as he was better known, may easily defy time and
the fickleness of destiny and be here with us —always.**

**This will not be so hard to believe. Satyen Bose, from
an early age, rose in the ranks, and at times outshone his
own contemporaries, determined through his own genius
to carve a name for himself in the niche of eminent Indian
scientists. When he wrote to Albert Einstein, he unwittingly
drew to himself that great illuminary's encourage-
ment and admiration.**

**It can surely be said now that Satyen Bose, whose
wizardry-like mind and outstanding keen sense of grapp-
ling with difficult problems was well-deserving the high
offices he held, and the crowning achievement of his
national professorship.**

There is no doubt that Satyen Bose, for all his many-sided brilliance, will ever remain one of Bengal's "greatest sons," and that his passing away, in the words of our Chief Minister, Siddhartha Ray, "creates a void so very difficult to fill."

It is, therefore, the purpose of this book to inspire and condition the mind of our future scientists to be, in the belief that, if a void has been created—and is still there — it shall be for a very short time. It has been said that if theories could have solved themselves, the result would have been Satyen Bose.

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CHAPTER ONE

THE SCIENTIST AND THE LEGEND

On the morning of February 4, 1947, one of India's legendary figures in the field of mathematical physics passed away ; and almost with the speed of a thunderbolt, news of his death spread to the people across the nation. This was indeed, a 'grievous loss', mourned the President of India in a condolence message. The heart strings of the nation tightened. In the words of the West Bengal Chief Minister, Mr. Siddhartha Ray, it was an eloquent and stirring remark that he made : "Bengal has lost* one of her greatest sons and his passing away creates a void so very difficult to fill".

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They came calling at the Iswar Mill Lane house from all walks of life ; academicians, men of letters and ordinary people ; every one of them with a burning desire to pay their last respects, to be there at a moment in history when it can be said as the Bangladesh Prime Minister, Sheikh Mujibur Rahman, put it : "Prof. Bose's contribution to science and humanity will be remembered for ever."

National Professor Satyen Bose was no more. Fellow of the Royal Society, Prof. Bose, had received several honorary doctorates, and from his countrymen, the Padma Vibhushan. But it was not these awards that brought him honour. He brought honour instead by receiving them.

The progress of science in Independent India has grown from one scientific success to another. And many of her greatest sons have helped to further the cause and progress of this nation, and this people, to a better tomorrow with the help of her advances in science. The names and achievements of Jagdish Chandra Bose, Meghnath Saha, C. V. Raman and Satyen Bose, are a galaxy of physicists the history of science will always be proud of. And yet, among this great band, Prof. Bose has formed a permanent link with the name of Albert Einstein, a link that will ever remain in text-books on Physics—known as the Bose-Einstein Statistics. And as

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Bosons, after his name, a term which was bestowed by P. A. M. Dirac.

Between tears and remembrance, the profound sorrow of the moment could not hush the great adventure of Prof. Bose's life, his intellectual and versatile mind, his remarkable gifts, and his passionate dedication to propagate scientific knowledge among his people.

And this was the legend of Satyen Bose, that although he made only two major contributions to mathematical physics, he was nonetheless a giant in the ranks. He had a deep and meaningful understanding of the mathematical, as well as the physical world. His versatility and vivacity permitted him to spend some thirty-odd years studying Chemistry, Mineralogy, Biology, soil science, Philosophy, Archeology, the fine arts, languages and literature.

He published in 1924, his paper called Plank Law and Light Quantum Hypothesis. This brought him to the forefront of the scientific world. The attention of Albert Einstein was drawn to it. Here then, was an Indian worth watching. And Einstein was quick to grasp this man's calibre, wrote immediately congratulating him on his work.

When scientific works make a stir there is more to it than its intrinsic merit much depends on the other

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scientists and their interests in the topic. Prof. Bôse was fully aware of this, and noticed that the scientific approach to the Maxwell and Boltzmann Statistics was not all correct. The behaviour of crowds of molecules as explained by Maxwell and Boltzmann, in their results were contrary to experimental observation. The flaw was discovered and the way shown how the method could be rectified to find the exact radiation law better known as 'Bose-Einstein' Statistics.

One thing led to another. The particles obeying this statistics were named 'Bosons'. It was shown how Bosons and Fermions together account for all known particles.

There are many things people fail to understand about the true merits of Prof. Bose's achievements. Why is it that he was not shown due honour till at a very late period in his life? Why did it take so long to appreciate and better use this scientific thermal power of a mind? People have even wondered why the Nobel Prize was not awarded to Satyen Bose. The answer might be found in the phrase, the test of time, and time had indeed shown the man to be triumphant in his work.

"Perhaps the last representative of the 19th century genius passed away from our midst." These were the words of Mr. Haripada Bharati, President of West Bengal unit of the Jana Sangh.

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The Scientist, Satyen Bose, can be assessed. And there was the other side, the man who enjoyed the sheer happiness of living. The friendly personality that always did welcome the common man; was ever prepared to spend hours on someone else's problems, and to advise those who needed his help.

"Prof. Bose has assisted me beyond my wildest dreams in my own scientific work," said a young man to me.

"He would stop whatever he had been working on to listen to my domestic troubles—and he told me, eventually, how to solve my family hardships."

"There are no words to tell you how much at ease he would make me feel in his presence. Prof. Bose was more than a teacher, he made me feel I was his friend."

"I have known Satyen Bose from the very early days when he would go to school and return home, walking with an open book in his hands. Even as a young boy he had a discerning mind, and could speak at length without being in want of ideas. Perhaps, he knew his own destiny, for he never seemed to be playful enough, or child-like enough to evade the notice of grown-ups."

The success of Satyen Bose had been won through sheer determination, perseverance and a profound under-

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standing of his desires. Belief alone can move mountains. And Prof. Bose believed – in his talents, in his ability, and in people. He believed that there is a reward for everything – that nothing is ever left forgotten – and he was duly acclaimed.

It was such a belief that had encouraged him in his own scientific experiments. Belief it was that made him respond to the plight of his friends – a belief that comforted him : for every good once done, two may be returned. Even the renowned Einstein had a deep respect for Satyen Bose as is evident from his letters.

And then one spring afternoon, the essence of Prof. Bose's belief came to reality when he was informed of the award he was to receive from his country – that of the Padma Bibhushan.

Tears flooded his eyes as he spoke with emotion. "I knew all along it would come to me, someday – and I am glad it has come now."

There were other kinds of happiness too and he received them all with a simple grace and a kind of humbleness that had surprised his near associates. Satyen Bose remained the unchangeable character he had always been – he even went on doing the little things he had followed for years. The rock was unshakable – and beyond the questioning looks that came his way.

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Prof. Bose had a single-minded striving for the perfection of his labours. He was never "stand-offish", but always approachable – and his kindness and simplicity was highly appreciated by even the Jesuits he came in contact with. "He was much more than a scientist: he was a *man*." Said the Rev. Fr. P. Fallon, s.j. adding, "He could speak of very difficult and abstruse subjects in a wonderfully clear and simple Bengali."

And because he could speak in such a lucid style, young people turned to him. He was responsible in awakening interest and enthusiasm in many of them – always careful to help those who showed a desire to investigate. He was a great father-image to Bengali youths in North Calcutta. His home was a welcome-place to those who tried to meet him.

In his own way, Prof. Bose contributed to the development of many young and budding scientists-to-be. He offered unflinching advice, and never made concessions if he felt it was not deserved.

The first stage of Bose's own development as a scientist, as will be seen shortly, embodied his own quest for independent and self-reliant qualities within himself. He did not take pity or sympathy when doled out by friends and relatives. He was of better steel and tempered by the uncorrupted laws of his personal nature.

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Sir Ashutosh Mookerjee had early recognised his great potentials and had asked him to join a department of Physics and Mixed Mathematics at the newly founded College of Science.

This Chapter was designed to permit an insight into the wide outlook that is so necessary in the understanding of a genius like Prof. Bose,

What eventually makes a man like Satyen Bose so well-respected ? What was there in his background that helped him to circumvent obstacles that might have easily discouraged another ? Can we learn from his life ? Can we hope to garner at least an ounce of his optimism — and will it be the crux of our own successes ?

The story about Satyen Bose has not yet begun. It is, as we will discover, the great adventure of a life that is greater still. Prof. Bose, once said :

“I always read the life of a scientist, once in a while - it helped me each time to better evaluate my own life. And I know how important it is sometimes to be reminded that you're not really alone, that there have been and that there still are those like yourself — all striving, each in his own way to accomplish a dream—a dream that will, in the final analysis, help all of mankind.”

Here then begins the life of Prof. Satyen Bose.

CHAPTER TWO

NEW YEAR GIFT TO THE NATION

1894. It is a year filled with many events. And people are still the same in their ways and habits—and each one as curious as the other to follow the news around the world. What one paper mentions with calm, the other does with fury, and the third, unpretentiously. But it is all there, for it is the news that matters.

In England, Prime Minister Gladstone, has made a bold decision. He has refused to tolerate the state of unmanageable affairs in his Government. With the polished move made from years of experience, Gladstone

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resigns from office. The nation and the world has been waiting expectantly for this to happen —yet, when it is done —the British are shocked. Lord Rosebery succeeds him.

On the other side of the map the Turks, massacre the Armenians. It is a sad affair, but it is the way of the world. And although this will be repeated for the next quarter of the century—it has to be, for destiny moves in mysterious ways.

Men are mere puppets, it has been said—but this is not so. For there are those who shape the spearheads of their own success. And we know of many men and women who have come through their most bitter challenges with garlands and rewards.

Captain Dreyfus has hit the headlines all over the world. His name is upon everyone's lips, and everyone has one's own strong sentiments and resentments for Dreyfus. Convicted of treason, Captain Dreyfus is dishonoured publicly. Yet, for all the evidence that is shown, there are many men who believe Dreyfus to be innocent. Among them, the world-famous author is Emile Zola.

And this is a time when even a nation like Japan is on the brink of a war. Time and again in the past the waves of discontent had been washed ashore and for-

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gotten. But this year it will no longer wash away. One morning the world is told that Japan has declared war against China.

In India, however, the nation receives a New Year gift. For on Monday 1st January, 1894, at his residence in North Calcutta, Satyendra Nath Bose is born. A chubby little baby boy, he has the wide forehead and sparkling eyes that will be so characteristic of him in later years.

There is great rejoicing in the family. And the womenfolk are as excited as a gaggle of geese. The air explodes with happiness and it can be felt in every room, as friends and relatives pour in with their greetings. This is a son for Surendra Nath. This is a future scientist for India !

It is not the time to disclose a deeper and more meaningful joy in the birth of this lad. But it will be known soon, with the passage of a few more years with the birth of five other children in the family. And then it will be known—that Satyendra is not only the eldest son, but the only boy to keep ever alive his father's name.

“ This child will rise to great heights, mark my words,” said a Brahmin priest one morning. “It is written

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that he will be known even in other lands. How this will be I cannot tell."

Nor could Satyen Bose's father or mother. But they had their own theories ; perhaps he would travel as a tourist abroad, they thought, and make friends with people in other lands. They did not realise then that the road little Satyen would take was the one on the rough pathways of Indian scientific research.

One spring morning, a year later, the child Satyen was outside with his young and attractive mother, sitting on her lap, playful and sunbathing, when an old neighbour of the locality came up to them.

" Your son, Satyen, already looks the *Gurudeva* type," he said, casually.

Gurudeva type. In other words, the child looked like the typical representative of the old-time teaching profession in India.

This, as fate was to decree it, would be the first of many hints as to the boy's future. And the young mother was careful not to forget it.

The birth of his sisters kept Satyen more and more to himself. He was the eldest. He was also the only son. The weight of this was already playing upon his child's

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tiny mind. This might possibly be the reason why he tried so hard to work, and achieve, and distinguish himself in later years. He was aware of his responsibility – and true to the orthodox Bengali tradition, he would bear, with his father, the burden of his family and their welfare.

Life at the Iswar Mill Lane house was one of calm and routine. His mother spent all her time with him and even when his sisters were born, she found ways to pamper, and encourage, and love him.

It was not surprising that Satyen had a greater attachment to his mother. That his love for music and literature had been planted by her from an early age of his life.

His father, Surendra Nath Bose, was an accountant in the Indian Railways. A quiet-living man, Surendra Nath was a great reader of books, and would spend many hours with them while Satyen crawled and played about the polished floors of the rooms.

In the Bose's home an outing was one of day-long preparation. Everyone would keep busy themselves, and the many servants, each with a task to accomplish, would find themselves all excited and busy. Then, once it was four o'clock in the afternoon and after a nice hot cup of

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tea, the long wait would begin for Surendra Nath's homecoming.

At precisely the same time he did each day, Surendra Nath would be seen coming down the street. He was a man who applied himself seriously to his work and his family.

“ Well, are we ready to go ?”

“ Yes. But you must first rest awhile, have a cup of tea – and then” his wife would say with concern.

The child Satyen had been observing all this, and even many years later in life, he would recall the great love of his parents for each other. He, himself would place his father as a model of his life, when he would have a family of his own. The goal that Surendra Nath tried to achieve, in being an impressionable father, had been ably met with.

The mainstream of events passed by, and five years were a mere passage in time with no bittersweet or well-known incident happening. It was for Satyen, “years that slipped away unnoticed and raised no memory.”

“ Mother—why does the moon stay up there ?” He once asked as a child.

“ Perhaps, God wants it to, son.”

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“ Mother, can it ever be drawn down ?”

“ No, my son.”

“ Why not ? If I throw anything up in the air it falls down —why does the moon stay there ?”

It was a far cry from the great scientific works he would one day accomplish ; but they were essentially the stepping stones to a deeper and more serious view he was to take in science.

One morning in the summer of 1899, little Satyen ran into his father’s room, breathless and excited.

“ What is wrong, my son ?” Surendra Nath asked, putting down his newspaper.

“ I think I know something.”

“ What about ?”

“ But it’s a secret, sir.”

“ And you won’t tell me, I suppose ?”

“ Of course I will—you’re my father. But I must not tell anyone else —well, not as yet not till I’m very sure of it.”

This, in a roundabout way had convinced Surendra Nath, that there was a streak of brilliance in his son. The elderly man launched out on a tireless bid to keep an

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observant eye on the boy. This child would need encouragement and attention. He would be inclined towards something, and although the Boses would not be able to know this till a few years later –they were still determined to mould and shape the lad, and prepare him for his future work.

“ Mother, when can I have friends ?”

“ Whenever you want to, my son.”

“ Well, I can wait then, Because I must know my friends first –and, Arun says, I’m not like other boys because I don’t join in their games so often.”

“ It is difficult to think of Satyen Bose as intensely keen on the pranks and tantrums of childhood, for his own life is more attuned to things of a serious nature”. was said by one of his close friends.

CHAPTER THREE

HIS PARENTS' INFLUENCE

Satyendra Nath Bose had been greatly influenced by his parents. His keen sense of observation as a child grew rapidly under their watchful eyes and he was taught to understand, and appreciate the problems people faced in life.

His father, Surendra Nath Bose, had, as most good people have, many friends and well-wishers. They would often call across at the Iswar Mill Lane house, and over many cups of tea, long discussions would follow. And Satyen was always there ; somewhere in the background, sometimes on his father's lap—listening to all that was said and debated over.

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He might have been only a six-year-old boy, but Satyen, with his large twinkling eyes and serious stare was always conscious of what the grown-ups said. Perhaps, Surendra Nath was aware of his son's presence, and on purpose he allowed the boy to stay on and learn.

It was a kind of learning, the kind that had proved useful to all the great men of the world. For Satyen, it was the most important part of the day, once evening came.

"Your son, reminds me of someone I can't at the moment recall—a famous man, when he was a child, of course," said a friend of the family.

"It is a compliment," smiled Surendra Nath.

"But it is true. That forehead, and those deep eyes—it makes me most uneasy—as though a life has been returned to us once more."

"Then I hope it is for the good of this nation," added Satyen's father.

And it has indeed, been a great life, for the greater good of India. The President, V. V. Giri, in his condolence message years later would say that Satyen Bose brought fame to the country.

But this fame would be a long way off and hard won. There were the years of childhood to pass—critical years,

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for it would shape his great qualities of simplicity, unassumingness and righteousness --attributes that would touch the minds of many generations yet to be.

Surendra Nath was a proud father. In his own way he had sensed the remarkable gifts his son would display. As an accountant in the Indian Railways he always kept before him, in a small leather frame, the picture of his son, Satyen.

And little Satyen knew this secret of his father ; it happened one morning, a day before Kali puja, when Surendra Nath took his son back to the office in order to retrieve a forgotten umbrella.

It was a long journey on foot, and the roads were then not fully paved or tared. All along the way Satyen held on firmly to his father's hand, watching all that went by : noticing even the little unexciting things.

These were the days of British rule, and the Bengali people were not all very happy about it. The dream of so many generations of Indians was now rushing towards an awakening. India would yet be an independent nation, free from the yoke of the foreigners -- and the child Satyen was to be a witness to his people's discontent and resolve to make India a home for Indians.

That fateful morning as father and son raced along the uneven road, the air suddenly exploded with voices.

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The lad stopped, though his father tugged at his hand to move on. The voices rose louder as a group of young Bengalis took the turning at the corner, and came face to face with the guardians of the law.

“Let us watch them, father !”

“No – this is not the time for it.”

“Why are they shouting ?”

“You’re too small to understand, son.”

“Is it something to do with the English, father ?”

“Yes. Now, come on or I shall lose a good umbrella.”

The office of the Indian Railways was crowded with clerks, and peons, and passengers to and from several parts of the country.

Surendra Nath led his son through a large wooden door till they were on the other side of counters. The pounding of typewriters and the click click of the machine that punched out tickets filled the entire place, and made it seem like a jungle of mechanical beasts.

Satyen was delighted.

His large eyes took in everything – and people were already of interest to him. He was amused watching an

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old man making funny faces at him from a corner of the room. Satyen laughed heartily ; startled, when his father said :

“That funny man is the Head clerk in the office, son. Would you like to meet him ?”

He nodded.

It was a happy experience for the boy, and even when he grew up, the face of that friendly Bengali was deeply impressed upon his memory. He recalled how the Head clerk spoke, stammering, but fully able to command his listener's attention. Even he, Satyen made note, spoke about the British to his father.

“This inflation is going from bad to worse soon we won't be able to live at all.” The clerk mumbled.

“It will take another generation, yet... ..but I think the British will leave.”

“I hope I'm alive by then to see my country free. Why, your little boy may be all grown-up by then.”

Surendra Nath smiled and ruffled Satyen's hair. “Yes. I hope he will enjoy our independence.”

“Why have you returned to the office Surendra ?”

“I forgot my umbrella -- you know how it is to be without one ?”

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“It’s over there —in the same place.”

The umbrella was there, and both father and son returned home without having said a word to each other. But that night, a little before his bed time, Satyen drew his mother down to him and whispered in her ears :

“I never knew father loved me so much. He has my photograph on his office desk.”

Amodini Debi, his mother, smiled.

“And I know he has one in his purse also,” she put it in a whisper.

About 1899-1900 a famine-like situation took shape, but it was not as bad as the great famine of 1866-1867 which took a great number of human lives in Orissa, having spread all along the Eastern parts from Calcutta to Madras.

In 1899 the relief measures undertaken were on an extensive scale, and Lord Curzon went about the work with great zeal and foresight.

Going on seven years of age, Satyen Bose was always proud to see the noble ways in which his family came forward to the rescue of the poors and the starvjngs. No one was ever turned away. And he decided on a plan of his own to be of help.

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It happened that Satyen would insist on taking his meals into an adjoining room and having it alone. The attention of his family members were brought to this point, for it seemed that he was also growing weak, and his face was looking drawn.

Surendra Nath discharged with everyone that the boy should be asked to explain himself—and he suggested that instead someone should see what he did with his food—for Satyen, inevitably always submitted an empty plate.

They found the door locked from the inside on the first day.

The following day, his mother, Amodini solved the riddle—she spied on Satyen passing out his food to an urchin through the wooden bars of the window.

After that day the beggar-boy was given a separate helping from the kitchen while Satyen sat down and had his meal with the family.

CHAPTER FOUR

HIS SCHOOL DAYS

The wheels of learning were slowly on the move, It was time for Satyen to go to school. And Surendra Nath had been talking it over with his wife. Would it be advisable to teach him at home? Tutors were not so easy to find –and if one did get a tutor, they were always so expensive to keep? But most of the young Bengali families were sending their children to educational establishments – it was the proper thing, decided Surendra Nath and that was, perhaps, the last word on it.

Satyen attended the New Indian school, not very far from his home. It was a private-owned and primary, and

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the class rooms were not as large as one would expect them to have been. But it was an education that made all the differences, and the residents of *Goabagan* did not mind sending their young ones to the institution.

The first day went off well. Satyen delighted in every moment of it, and on his return home he had so much to tell. His mother, Amodini, proud of her son, listened with rapt attention to everything he had to say. He spoke at length about his teacher and the way she conducted the children, and how she spoke to them, and the questions she had put to them, till it was evening and time for their dinner.

School-going was a thing Satyen fully enjoyed. Unlike many of the other youngsters, he never cried, or made a fuss about it each day. It would surprise him, however, to find the other children in such a state of distress.

“ Why do they cry so much, mother ?”

“ They don't know what it means, perhaps, to be unable to learn.”

“ I like to go to school.”

And Satyen loved it so heartily, he made a point of doing his best for each of the tests –and with every test he would lead his class. The best boy in studies was

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also the best boy in conduct. And Satyen wanted it to be that way. He was a born leader—an example-setter, and already the other children looked forward to his friendly talks with them.

Samir, was a year and seven months older than Satyen. He was not a social type of boy ; stayed aloof from the others, and behaved aggressively each time one of the children went up to him, One afternoon, Satyen decided to do something about Samir. The boys warned him to stay away from the other fellow, but Satyen was not afraid.

“ What is your name ? Mine is Satyendra Nath.”

“ Why do you want to know my name ?”

“ Because I would like to be your friend.”

“ Why do you want to be my friend ?”

“ Because you’re older than me, and stronger, and you could always help me if I’m in trouble.”

This appealed to Samir. He and Satyen became good friends.

The monsoons were the worst time of year. The roads got easily flooded and the lanes were always knee-deep in water. Children loved this weather more than the grown-ups ; only Satyen kept his opinion to himself.

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“ How does Satyen like this season ?” Amodini Debi once asked her husband.

“ How should anyone know—he’s so much like a closed book on the subject.”

But Surendra Nath knew better. He had often spied his son standing in the pouring rain, letting the cool rain-water soak into him—and then, coming away as though nothing was wrong.

One afternoon he walked away from the rain into his father ; and was startled to find he had been discovered in the midst of a rain-bath.

“ Well, I suppose you have a ready answer ?”

“ I am wondering, father, if there is any difference between rain-water and tap-water, and if there is I shall like to know about it.”

And how aware Surendra Nath was of his child’s genius is shown in the words of one of his relatives. He spoke of Satyen with more than a fatherly interest. He seemed almost in awe of the lad, as if he alone had been chosen to watch how destiny shaped the boy’s future.

The New Indian school was a stepping stone for Satyen Bose. He learned how to make friends, how to adjust to routine, how to keep the mind active, and to be able to work problems out on paper. But of course, the

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problems of joining letters, making sentences, knowing when to break up words, and what not.

A teacher in the school, the children called "Didi", was an arresting storyteller. And Satyen would always look forward to her coming. Unlike his mother, Amodini, who could recite from the Ramayana so well; "Didi" would bring along stories of fairy-like people, and giants with one eye, and dragons that blew ribbons of fire at people.

At night, those thrilling stories of "Didi" would play in Satyen's mind. Often he would wait patiently till Amodini had ended one of her epic-tales, to ask if she knew anything about dragons.

"Satyen pays no heed to my Ramayana tales, or so it seems to me." Amodini complained to her husband.

"Why don't you ask him that you should stop telling him bedtime yarns?"

"I will, tonight."

So, she put the idea before Satyen, that since he never paid attention to her stories, she ought to discontinue telling them to him. Satyen protested.

"But your mind is elsewhere, son."

"I know, Mother, but your presence is here with me—I need that more."

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Tears of happiness welled up in Amodini's eyes, and she embraced her son.

No more was said again of those bedtime stories.

The school years were moving along rapidly and Satyen grew better in his studies with the passing of each year. The boys fought amongst themselves to win his approval and friendship. The Iswar Mill Lane house was well known to his little companions.

Once he brought home a report card where 110 was given to him out of 100 for mathematics.

Surendra Nath decided to point out this blunder to the mathematics teacher.

"No, sir, there has been no mistake," said the teacher, producing Satyen's test paper at the same time.

"He has done all the sums, correctly."

Surendra Nath nodded.

"Including the alternatives—all within the appointed time."

His next *alma mater* was to be the Hindu School, where he passed the Entrance (that is, school-leaving) Examination of the Calcutta University in 1909.

His interest in science was more than casual. He started reading books on the subject outside those pres-

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cribed by the school, or University. His keen sense of getting down to the core of a complex problem was uncanny. He made great demands upon his flexible mind, open to the possibility of any theory that might have a working chance.

Qualities of greatness are hard to come by. Here was a youth harnessed with the very finest mind, and able to command it at will. He could surprise a visitor with such startling questions as those for beyond his own years.

“Tell me, Sir, you’re a man of science : is it possible to stop the aging process ?”

“ It may take some time yet, but I think man will be able to.”

“ I would like to know how it could be done,” he said with a faraway look in his eyes.

“ Satyen,” his father would interrupt, suddenly, “Your mother wants you.”

And he would rise, take his leave and walk out of the room.

There was yet another side to the brash young Satyen Bose. He loved casein sweets, particularly *Sandesh*. He relished the taste of almond paste, and cream, and would eat it whenever offered. But a sweet-tooth did

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him no harm. And he encouraged his school friends to become like himself -a *Sandesh* eater.

Among the indoor games that fascinated the school-boy Satyen, was carrom. He could make a beautiful strike, and marvelled at the number of scores he made above those of his classmates or his relatives.

“There is a science to it,” he would smile each time, and make yet another score.

A story goes that one of his neighbours at *Goabagan* called across, and in an air of challenge, asked Satyen to play against him.

“ I will, my friend, accept your challenge, if you agree to stand me and my school mates a round of *Sandesh*.”

“ Agree !”

The result was that twenty-one children had a *Sandesh* each because of Satyen’s skill in the game.

CHAPTER FIVE

HIS COLLEGIATE YEARS

The professor stepped into the room, confident and alert, alive with the burning zeal of his own greatness. He stood for a fleeting second on the wooden platform of the classroom, the black-board behind him, and a group of young men before him, eagerly awaiting to begin their life at college. He scanned their faces—hopeful, expectant; soft, warm, clay-like ready for the highest moulds prepared in science. Any one of them could become renowned. May be many from this batch would be another Professor Acharya Jagdis Chandra Bose, smiled, and the tension vanished. The students relaxed.

HIS COLLEGIATE YEARS

“May I know your name, please ?”

“My name is Jnan Chandra Ghose, Sir.”

“And yours ?”

“Jnanendra Nath Mukherjee, Sir.”

“Nikhil Ranjan Sen, Sir.”

“Pulin Behari Sarkar, Sir.”

“Sailendra Nath Ghose, Sir.”

“And you, young man, why are you sitting so far away ?”

“My name is Satyendra Nath Bose, Sir ; by sitting at this distance I thought I could observe more than just the black-board, sir.”

Thus began Satyen Bose’s college education at the Presidency College. From the very start he had been looked upon as one who “ should be kept a watch one. ” And the famous teacher, Acharya Jagdis Chandra Bose, tried to keep Satyen on one line of endeavour.

“Learn to centre your interests on one thing. You have too many irons in the fire. Why are you so restless ?”

“It is, perhaps, because I have a thirst for knowledge, Sir. I want to know many things –and I feel I must try to meet it half way, Sir.”

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He took his studies seriously. He could solve the most difficult vector differentiation ; or understand the divergence theorem, Stokes' theorem, and related integral theorems. The first two years were considered, normally, to be the tough-time for science students.

For Satyen, it was as easily understood a subject as say, the alphabet for a class seven pupil.

He would pick up books with Physics problems, study them till the small hours of the morning, and in a short time be able to solve them by himself. The laws of probability, statistics and vector analysis all came in the framework of his interest.

Even then, as a youngman in science, he was intrigued by the theory of numbers. And this drew the attention of Prof. Cullis, one of his instructors at Presidency.

"I'm wondering if you would be keen in helping us make a few notes on Dedekind's theorem, for circulation in class. I believe you're interested in numbers ?"

Satyen nodded.

At the B.Sc. level, Meghnad Saha joined the Presidency College. Satyen and Saha, almost immediately teamed up. They were good friends, and together with Nikhil Sen, Pulin Sarkar, Sailendra Ghose and others, formed

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one of the most brilliant groups at the college and the Calcutta University.

Aside from Professor Acharya Jagdis Chandra Bose, as their teacher, there were other popular figures like, Acharya Prafulla Chandra Roy, Shyamadas Mukherjee, D. N. Mallick, Prof. Cullis and many more. These were the dedicated men to the cause of Indian scientific research. They were great educationists and men of letters.

Each one of them as Head of his own department had been alert enough to realise, that their students had great possibilities if directed in the proper way.

The B.Sc. term was soon drawing to a close. All the work had been done, the revisions and the practicals. All that was left now were the final tests.

At home, Satyen Bose, kept more and more to himself. He liked being left alone for long hours and only his mother, Amodini, could intrude into his study. His sisters (he had five of them) were kept away from his studies. But he would come out of his room, amuse and entertain them, and then, as a book-worm might, return to his books.

The date for the examinations was fixed. He was fully aware of the task ahead and more so, as he had taken Honours in science. There were great odds to

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contend with and the competition, he knew, would make it even more exciting.

If the sayings were true : “All work and no play.....” then Satyen had it always in mind.

In the early evenings he would go out of the house for walks down the old Calcutta streets. Where he lived in those early days a great number of ‘khatahs’ and cows were kept there. One of the reasons why it’s known as Goabagan to this day. And the youth of those times were as full-blooded and playful as our young ones are.

It happened one evening, that Satyen noticed a knot of boys around the corner at eve-teasing games. The youngsters whistled out, and called to the girls, and made a nuisance of themselves.

Satyen could bear this no longer, for the girls were very upset over it all. He decided to meet the fellows and scold them. But when they saw the burly young-man coming towards them like a wild bull out of its pen –they scattered in all directions.

The same incident took place the following week, and this time Satyen grabbed the leader.

“ This is a warning, friend,” said Bose, “there are better things in life you could do –so why don’t you go

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and find what they might be. There is a time for girls, you know, and your time will come.

The youth went away, unbelieving, that someone his own age could talk to him like a grown up would. But there was about Satyen, something that compelled his listeners,

On the morning of the B. Sc. examinations Satyen Bose arrived at the college with only his bottle of ink and a pen. He wore on a white kurta and pajama, and for once his long hair was well groomed.

“Satyen, where are your books ? ” Jnan Ghose asked.

“No need now, for them.”

“But surely you’d like to have a last glance ?”

“No, not I,” smiled Satyen.

Although his friends thought he was a “brag” at the time, they didn’t dare tell him. Then, the first bell went, and the boys began to stream into their respective classrooms. Satyen was the first student to be found seated at his desk. Calmly he took his questionnaire –scanned it once, and began to answer them one by one.

Long before the appointed time he submitted his paper.

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Time has a way of finding its passage regardless of man's failures or successes—regardless of the world's doings or misdoings. And in a short while the long years of toil, and study, and dedication to a college life seemed to be at an end. The B. Sc. tests were over. The first battle won.

The boys knew they would fare well. What they did not know, was, who would do better than whom ?

The next few weeks were passed in great anticipation of the forthcoming results. There would be celebrations, and gowns to wear, and family congratulations to acknowledge, and decision to study on or not, would have to be taken by many.

“Well gentlemen, who do you feel has done exceptionally well ?” Acharya Jagdis Chandra Bose asked his students.

No one said a word. But it was a known fact that the race would be won on the top, by either Maghnad Saha or Satyen Bose.

Even the professors were aware of this, and refused, themselves, to say which one of the two would make it. Maghnad Saha was a good scholar and had proved himself to possess a fine mind. He too, like Satyen Bose, was destined to achieve great scientific distinction.

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When the results were finally announced, it was Satyendra Nath Bose, who topped the list.

“Congratulations, Satyen !” And it was Meghnad who said it first.

“What do you hope to do, now ?”

“To move on –take an M. Sc.”

“Same here.”

The two friends walked confidently down the street. The first step had been taken—ahead on them lay the ‘boundless ocean of knowledge.’

CHAPTER SIX

ROAD TO GREATNESS

Satyendra Nath Bose was a natural scientist : he could have easily been the one to have said : ‘I seem to myself like a little child.....’ There was no lack of spontaneity in him, and at moment of stress, he could come out of the greatest scientific entanglements wreathed in smiles.

Bose has been described as sitting like a pensive friar, snug in the arms of Morpheus, wearing a white shirt, one size too large, and a look that peers through the dark corridors of time and space.

ROAD TO GREATNESS

Satyen Bose was the most sensitive, the most practical, of the great Indian scientists. The mere establishment of a theory was enough to convince him that it would be of still greater importance. As a result we find him, both careful and methodical in his own works from a very early age. 'I am not infallible,' he once said, and later changed it to : 'I do not think I am infallible.'

But in 1913, Bose had, candidly speaking, a long road yet to traverse. His constant study, would ultimately, cause an estrangement between himself and his close friends. 'The incomprehensible situation quite amuses me to recall,' he had a wont to remark.

The seed, however, had been sown. And any compulsion to greatness had never once entered his mind. He was doing what he felt, he could do best—understanding science.

Many of his classmates had been lured away from Science. It was a craving for filthy lucre that had inveigled them into avenues of lucrative professions. And in those days of the British Raj, it was not the competition that one had to confront, but the humbug of being a Bengali.

It was absurd. But when were things not absurd ? Things like collective mistrust, and loyalty, and British so-and-so, would always be ridiculous. Even a young

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intellectual like Bose, completely ignored such starting-points. He was spell-bound with his own interest in Science ; and that alone mattered.

“Why not try now for a cushy job, Satyen ?”

“What would you mean by that term, ‘cushy job’ ?”

“Well, the Indian Civil Service, for one.”

To Bose, that was absurd.

But although he tried, devotedly, to do all his work—and much of what he did as a student had been heartily welcomed ; it was difficult to comprehend why no scholarship to study abroad was awarded him.

“ I’m not worried about scholarships,” he assured his disturbed father. “There is too much for me to do right here. Who knows, some day I might go overseas after all, and that would be another way to study abroad.”

He had a way of bending the most difficult situations and to alleviate the pressures.

He was never spiteful, or annoyed at the violent ways of some men. His tender-hearted devotion to those that knew him was a growing experience. He could hide a man’s faults and make him feel a new person, while at the same time, dress him down.

ROAD TO GREATNESS

Doing his M.Sc. was a question of incurring responsibilities. He was constantly aware of his father advancing in age. He knew that five sisters in the family meant a great burden to his parents, and that his father must be having some privation, as yet unknown to him.

He was nineteen years old, and already the old-fashioned notions were there to haunt him. He ought to be working; bringing in some money to assist his parents in their management. He was, after all, the only son --and the eldest child.

In his own way, Satyen came to grapple with the problem. All he would do, he decided, would be to wait till he went through his M. Sc. exams. Things would work out he told himself--worrying never brought any solution.

So, he went back to his books.

We need not stop here to inquire what drove Bose to this decision. It will be understood that under the circumstances, it was the best possible thing he could have done. His judgement was the right one --and in the years to come, his family would praise him for being so level-headed a youth.

The festering sore of the British in India, had already taught Satyen a lesson : the best way to fight a problem was to face it.

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His friend was Meghnad Saha —and Saha was only a few months older than Satyen. The two of them had much in common. They were scientists-to-be. Destiny had spun its web so close, the two young men were almost knit-together in their ambitions.

“ We must try to appreciate one fact, Satyen ; the best brains in the world are today at work in other lands—trying to solve scientific theories and writing papers on them.”

“ True. We must wait for their translations.”

“ Which can take years, perhaps.”

“ What do you propose, Meghnad ?”

“ Why can't we learn a foreign language—the University can help ?”

Satyen Bose thought it to be a grand idea. There was much to gain in this. If they could learn a foreign language then the possibilities would be endless where their work was concerned as students in Science.

“We should decide on a language,” Meghnad said thoughtfully.

“German would be right—and then French.” Added Satyen.

“Who could devote time, aside from the University classes, to teach us German ?”

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"Prof. Burle would, if he feels we deserve it."

Prof. Burle complained that his impressions were not all too bright, concerning students who showed a desire to learn German —did it for a month, and dropped it thereafter, German classes at the University were also poorly attended.

It was Satyendra Nath Bose who, with hardly any effort, was able to persuade Burle, that this time it would be well worth trying. They joined the University classes and Burle.

Meghnad and Satyen turned out to be two of the finest students of Prof. Burle. They were not only outwardly keen, but decisively certain of their desires. It took them all the effort and all the pains to learn German.

"Are you catching up with it, Satyen?" Meghnad asked.

"I'm feeling spirited—I want to finish all this soon. You seem to have caught on very fast and you can already speak it so well."

"So can you."

Prof. Burle's final verdict was a round of applause the formidable task of learning German was over. The mutual intensity with which the two friends had attacked

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the language, could have had only one answer from the very beginning —success !

“It has been worth ”

“But of course.”

The epoch of educational, scientific, and cultural revolution had begun in Bengal. There was nothing any more to be in the affirmative —the age of progress and perfectibility had started. The very air in the country was sober and calm, broiling within the nucleus of a free and better India to be.

All in their youth, men like Jagdis Chandra Bose, Rabindranath Tagore, Prafulla Chandra Ray, Nilratan Sircar, Swami Vivekananda and Ashutosh Mukherjee were making their mark in various fields. Those were the giants in Bengal. There were a cluster of great minds, dedicated to the cause of laying a foundation for the future of Bengal.

In 1913 the Palit chairs for Physics and Chemistry were founded, and the first men to win them had been C. V. Raman and Prafulla Chandra Ray. The very following year the Ghosh chairs were opened and held by Ganesh Prasad (Applied Mathematics), S. P. Agharkar (Botany), Debendra Mohan Bose (Physics) and Prafulla Chandra Mitra (Chemistry).

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Around this time a literary coterie was started by that brilliant scholar, Pramatha Chaudhuri, nephew-in-law of Rabindranath Tagore. It was known as the *Sabuj Patra* group. Both Satyen and Meghnad came to hear of this group and decided on joining them at their Sunday soirees.

CHAPTER SEVEN

MARRIAGE : A MILESTONE

Satyendra Nath Bose was 20, a time when young men feel the first awakening of desire. He had been aware of love, but if this made any flickering difference to the youngman was not to be known.

At first almost uncomprehended Satyen Bose did his studies without mention of any romance. Perhaps, it was the Bengal of those days, where men conformed to rigid and unwritten laws and lived orthodox lives. He might have had the choice of a word now and again : but never once dreaming of the impulse to propose or contradict the wishes of his parents.

MARRIAGE : A MILESTONE

Doing his M.Sc. was worry enough. There were the advanced books to deal with on every aspect of Mixed Mathematics. His friend, Meghnad Saha, was a constant help to him. Meghnad could fathom the end product of a problem as easily as Satyen – and often with a twist in an unusual way. But even Saha did not concern himself with the demanding question every youth must someday face – the one about the future, and the makings of one's own family.

It happened one afternoon that while Satyen was busy understanding a physics example, he saw a genial-looking, saffron-robed fellow walk through the house towards his father's room. There was something decidedly familiar about the man and Bose tried to place him. At first it was not quite as simple. Then, an hour later, the saffron-robed elder walked away smartly from the house.

Satyen retired to his room that evening and wondered who the man could have been. He propped himself up in bed, thinking, and then rose suddenly startled at his own thought : An astrologer !

What on earth for ? He knew well enough his father never consulted one for personal solace or advice. Nor did his mother. And yet, a sooth had been called, consulted, and paid for. Why ?

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“An Astrologer called at the house, yesterday,” he told his friend, Meghnad.

“So, is that unusual ?”

Satyen summoned enough courage to explain that it was. And the imperious look on his face assured Saha that something was certainly brewing in the Bose family.

“Why don’t you ask your father ? ”

“Let’s say, I don’t wish to know, any further.”

They both smiled.

A week later, Dr. Jogendra Nath Ghosh called at the Iswar Mill Lane home of the Bose’s, Once again Satyen was at home to see the well-known physcian make his visit. This too, was unfamilliar for the doctor had never been so close a friend of the family, as to pay them a visit.

Dr. Ghosh was an ardent admirer of the arts ; and Satyen could not help feeling that this visit would be in some way connected with a forthcoming festival. The worst, he mused to himself, would be that his father had perhaps the need for some medical advice. As it turned out, neither was correct.

Soon after Dr. Ghosh left, Satyen noticed his’ father, Surendra Nath peering out of the window in deep thought.

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The air was hushed with expectancy as Satyen decided to walk up to the aging man.

“Ah ! there you are, son ! ”

“What is it, father ? ”

It was an old trick with Surendra Nath, but he used it again, speaking diffidently and haltingly and always on the subject of how it was with Satyen to be doing the M.Sc. course. Satyen responded with the same rehearsed lines. Then, just when it seemed that Surendra Nath would tell all, he nodded to himself, left what he was saying unfinished —and walked away.

Something was going on, thought Satyen aloud.

The mind of Satyen Bose went to play on the mystery of the recent happenings. First it was the genial-looking astrologer — then the visit of Dr. Jogendra Nath Ghosh — followed a few days later by his own father's visit to the medico's home. All these going's-on had to have a plausible explanation —and it did.

“My father has my marriage in mind,” he told Meghnad that evening.

“Marriage—how do you know ?”

“I don't but I assume it. Let me present you the facts: The astrologer is always consulted in such

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affairs—you know, matching horoscopes and what not. Then, Dr. Ghosh's visit --and the doctor, if my information is correct, has a daughter for marriage."

"Well, if you're right—let me congratulate you." Saha grinned.

"I can't imagine it happening to me at all."

"Why not? It has to happen some time, so why can't it be now?"

"I'm already anxious."

"Don't be—it will come and pass, all in a very short time—and you'll be glad its all over."

"You know, I wish my father tells me about it soon."

By the austere standards which he imposed upon himself at times, Satyen tried not to think any more of his forthcoming marriage, if indeed such were in the offing. After all, his assumptions could well be wrong. There was really so much to bear in mind, and the name of Sir Rashbehari Ghosh was always the talk of the University students.

If it was correct, though Satyen and Meghnad, then the gift of Sir Rashbehari Gosh's ten lakhs in aid of the University College of Science, would be a great help to the advancement of Indian science.

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"We will be able to have proper research and library facilities."

"It may not be in that direction at all."

"What have you heard ?"

"It may be more for the expansion of the post-graduate departments."

The polemics of Sir Ghosh's gift of ten lakhs would be a lively topic for many students, even years later. Here was an opportunity to hope for a better future. This would not be the only gift –and what with Sir Ashutosh Mukherjee, as Vice-Chancellor of Calcutta University, the cause of higher education in Bengal was assured.

The M. Sc. course would soon end and the final papers to be done might possibly change their entire lives. To Satyen, all this meant a rational demand on his time and study ; for he believed in the search of knowledge –and that did not centre on science alone.

Though Meghnad Saha was destined to rise to heights of scientific endeavour, almost overnight, Satyen Bose would take a little longer to make his mark.

It was the present that mattered and no amount of distractions could take his mind off the strange brewings at home. There was a marriage being arranged—and he knew it. It would be a milestone in his life. Only his

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parents would have to let him know—once they approved of the girl.

Boishak, or the Bengali New Year in 1914 fell in the month of May. The heat of summer was already oppressive—and everywhere it was the same talk : how to remain cool.

Surendra Nath had decided that his only son should be married in *Boishak*. It was the most appropriate time, except that sultriness of summer might make it all the more uncomfortable.

The girl, chosen for Satyendra Nath, was none other than Ushabati Debi, daughter of Dr. Jogendra Nath Ghosh. It was an apt choice, correct in both horoscope and character. She was one who could appreciate his greatness, and respect his ambitions. She would be beside him, always, with sweet words of praise and encouragement during success and failure, hope and disillusionment.

The occasion of the wedding day arrived. Visitors flowed in, bubbling incessantly, full of the best wishes, and it was anyone's guesswork to know who was who. Satyen quite enjoyed watching the assortment of guests and the women in their gaily coloured saris—it was like a carnival at home.

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But after the ceremony, and the last of the waiting days had elapsed, he sat down and looked at his wife, who had returned to him inviolate, calm and composed — yet a trifle shy and diffident.

There wasn't much one could think of saying.

So, he put out a hand and she reached for it. They sat like that wholly aware of a residuum of happiness, an aspect of reality neither of them, right then, could fully explain. But he knew as she did—they were now, man and woman, welded together to gratify the purpose of fate.

CHAPTER EIGHT

BURNING THE MIDNIGHT OIL

In 1852, John Henry Cardinal Newman, in his discourses on the idea of a University, said: the University "educates the intellect to reason well in all matters, to reach out towards truth, and to grasp it." Although he had followed the English idea of a University, he stressed the fact that it was also in order to make men "more intelligent, capable, active members of society." Above all, its greatest object is to make its students "gentleman", "and not simply to protect the interests and advance the dominion of Science."

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The University of Calcutta, under the able guidance of Sir Ashutosh Mukherjee had become, by 1915, a cosmopolitan University. "Research had received a great stimulus at his hands and teachers and students in the post-graduate departments were engaged in widening the bounds of knowledge."

Although the Calcutta University was in a comparative state of starvation, the Government being unsympathetic, yet much was being accomplished. Scholars collaborated on several tasks to assist the University. And "several men of culture have come forward to the aid of this University." The Maharaja of Sonapur ; Holkar of Indore ; Mr. R. D. Mehta, all put in generous contributions. The University was functioning well.

It was obvious that the Calcutta University, in spite of all setbacks would eventually make its own historical mark. There were critics who abandoned the idea of doing-as-the-government-says ; and were firmly of the belief that a line of moderation would prove the unmaking of her detractors.

In this atmosphere, Satyendra Nath Bose, came through with flying colours in his M. Sc. examinations. He won a First Class degree in Mixed Mathematics. This alone proved, beyond a doubt, that he had the qualities of greatness within himself.

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Now, life would be slick and streamlined, and his efforts would bring in the dividends he had so long waited for. His private emotion, however, was never known. He was a scientist who was emotionally and aesthetically bound to the realistic attitudes of his times. He enjoyed from young, the ways of conformity. He would be known among Bengal's intellectuals as the scientist who blundered into the arts. And with his M. Sc. degree in hand, Satyen had great plans.

The University's immediate reaction came the following day. Bose was a rare man whom success did not harm. The University's Vice-Chancellor congratulated him, and in not so many words, made an offer of a teaching post. But Satyendra Nath needed time to think it over.

Though Satyen was gregarious, he was also a shy man. His best friend, in those University years, was Meghnad Saha. Saha was too friendly to be a symbol and too lonely to be a saint. But the pair got on well in their attitudes together.

Together they had studied Max Plank's Quantum Physics. It is interesting to recall Prof. Bose's words : "We thought that perhaps all the world phenomena would be investigated and analysed in the same way : starting from a set of axioms and following it up by methods of deductive reasoning, basing our views on certain differen-

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tial equations with certain initial conditions ; thus we could, in principle, successfully explain all physical phenomena. But very soon, when we were still students, the Quantum theory cropped up. Physicists began to know that after all there were many events for which the usual description on the basis of the law of cause and effect could not be applied and newer methods had to be devised. Ultimately we gave up Newton's determinism''.

Max Plank's Quantum Physics had been a new experience for Satyen. He sat up into the small hours of the morning while mosquitoes buzzed about his face unmolested. The dustbins on the streets smelt highly; but none of these could distract his attention from understanding, what took Max Plank all his valuable time to observe and write on.

Prof. Bose, however, once tried to explain how the Indian scientist sometimes works. He said : "Of course, we Orientalists, are reputed to have a sort of a different way of getting knowledge, a sort of intuitive knowledge and if you want to understand how the tree grows, you try to think yourself at one with the tree, and then once having brought yourself in tune with a particular phenomenon, you will perhaps be better able to understand it than when you simply observe it from outside."

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In 1905, Albert Einstein had published his Special Theory of Relativity, in German. Bose and Saha had

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managed to acquire a copy of the work, which they translated between them. It was a great piece of scientific research—and Satyen had expressed his desire, for the first time, to write to Einstein.

With the passage of the years, in 1915, Einstein published his General Theory of Relativity. Once again Satyen Bose was intrigued. He once declared that scientists : “are directly concerned with results. And therefore, certain methods have been developed and older ideas have been given up.”

The General Theory of Relativity, kept Satyen awake for many nights.

“Why don’t you rest son ?” Surendra Nath once said coming into the room at 2-30 a. m.

“Yes, father I will.”

Things scientific meant a great deal to Satyen Bose, and he possessed so many wonderful views about this great ambition of his. He is remembered saying : “I think that the scientist now claims himself to be a person who has got a greater knowledge and more intimate acquaintance with nature. He not only relies upon his personal experience but can fall back upon years or centuries of recorded experience of the human mind. And if we believe in evolution, then we may say that through

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thousands of years there has been a simultaneous development, a slow process but essentially the same in all the countries, whereby man has gradually awakened up to his responsibilities and now, in the twentieth century, feels responsible enough to take his position as one who is able to guide his destiny."

The youth with (-15) spectacles, had taken his first "giant step." His M. Sc. degree presented him with a sanction to practise being the scientist he had grown up to believe he was. Nevertheless, Bose would consistently elevate the opinions others had of him. Slow as he might have been in his work, he kept steadily at it. After all, it was only the year 1915.

An entry in his diary at this times reads : "There is so very, very much to do...Books to read from abroad... must keep in touch with scientists .."

The year was slowly coming to an end.

But, in this year alone, the world was to witness some of the most startling disasters to be recorded. In Central Italy, without warning, an earthquake rocked the city. It lasted for the period of a few deadly seconds, enough to leave death and destruction in its wake. The newspapers around the globe revealed and estimated 30,000 people were killed.

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On March 2nd, at Layland, West Virginia, tragedy struck the peaceful coal-mine town, when one of its mines exploded. The barrenness of that sudden shock, sent waves of sorrow across the American nation and the world. Some 112 men lost their lives that day.

The nucleus of all these losses was deeply imbedded in the Lusitania, a British passenger vessel which was sunk by a German submarine. The heavy loss of American lives severely tested their neutrality. The Cunard ship sank off the coast of Ireland. The number of lives lost were 1,198.

Nature however, always maintains a balance to everything, and strictly relegates to a fair and just measure of both. In Bengal, Satyen Bose received his M. Sc. degree ; and a future Chief Minister of Gujarat, Hitendra Desai, was born.

The scruples of time, or whatever the events around the earth ; nothing apparently could influence Satyen Bose or his friend Meghnad Saha from doing what they were cut out to perform.

German scientific papers went on being translated by the two, and were readily available long before the standard books had got down to the task. The works of Eddington, Elsenhalt, Coevent, Schouton,

BURNING THE MIDNIGHT OIL

Frenkel, Tolman and others, were already under discussion thanks to Bose and Meghnad. This was indeed, a team well worth their Mark. Only destiny had other plans for Meghnad Saha.

In one of his diaries kept as a youth, Bose made the following entry :

“Very close approximation discovered of Saha's new scheme. He is fascinating to observe - has a brilliant mind, and will eventually make his name in science.”

These words were to become prophetic in a short space of time. Their togetherness, though it had been for a little while, was one filled with personal moments of instant performance and predictability on their part. They were two bright stars in a galaxy of great men that spiraled within the borders of Bengal.

Mention should be made here of the Vice-Chancellor's offer to Bose. Sir Ashutosh Mukherjee would be one of the many men, who would appreciate Satyen Bose as a thinker, scientist and teacher. Mukherjee was aware of the internal disturbances of the University. It was left in his hands to calm the noise, to secure the portals of higher learning in Bengal. One of his many measures was in offering posts to men he decided on. It had been heartening for him, when in October, 1915, Harcourt

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Butler wrote, "with Sir Ashutosh Mukherjee, all powerful, we would have no enquiry into the University which will come to anything,"*

It was with the force of this power that Ashutosh Mukherjee desired to appoint Satyen Bose. There were great days ahead for the University, and anticipating the figure, Mukherjee could only want the best—the cream of Bengal to be the professors of this great institution.

M. A. and M. Sc. teaching in other colleges had to cease ; and that the post-graduate teaching should be wholly in the hands of the University became a law. This was only the beginning--the Satyendra Nath Bose had followed the throb of higher education each step of the way.

"I must join the University, Ushabati," he said one evening, the way he always confided in his wife.

She nodded in agreement.

* N. K. Sinha—Ashutosh Mukherjee, p. 204.

CHAPTER NINE

HIS VERSATILITY

The educational scene had changed completely during the past few years. In 1912, Taraknath Palit made a gift of seven and half lakh rupees to the University—for the advancement of Science and Technology. The following year in August, it was a lawyer, Dr. Rashbehari Ghosh, who presented the University an endowment for the College of Science. All this helped to establish four University Professorships, each for the following subjects : (1) Applied Mathematics, (2) Physics, (3) Chemistry, and (4) Botany. An additional eight studentships was founded to the value of nine hundred rupees from the fund.

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On the 27th March, 1914, Ashutosh Mukherjee laid the foundation stone of the University College of Science. Reserve funds were put to use in the construction of the building. Sir Ashutosh, in his speech that day, remarked : "But although we are constrained to acquiesce in an humble beginning, our hopes are well founded. We confidently look forward to gradual expansion, to a life of sturdy growth and uninterrupted activity, for our cause is noble, and we are inspired by the invigorating belief that Science in its ultimate assertions echoes the voice of the living God."

Almost immediately, Ashutosh appointed Dr. P. C. Ray, to the Palit Chair of Chemistry, and C. V. Raman for the Palit Professor of Physics. C. V. Raman in time to come won the Noble Prize for his research in Physics. Ashutosh had a way, always, of discerning merit.

With this back-drop and an unusually narrow outlook of the British in India ; Satyendra Nath Bose was made a lecturer in Physics in the newly founded Science College of the Calcutta University. It was the year 1916. The classes were opened for post-graduates in modern Mathematics and Physics.

Both the friends, Bose and Saha assiduously began their classes.

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For some time Satyen Bose had been wondering why students were not able to answer a certain mathematics examination-question that had been set by Sir Ashutosh. On reading it himself one afternoon, he drew the attention of Ashutosh to the fact that the question was set wrong.

Students took readily to Satyen Bose. He was a friendly, understanding teacher, and on several occasions had even gone out of his way to help his students. He was never, too busy not to be interrupted ; and even when a pupil disturbed him at home, it was all right with him. The problem of teacher-student communion was something Satyen Bose, even later on in years, was not able to fully comprehend.

At a symposium, in Tokyo, Japan, Bose mentioned this fact in his talk :

“The problem of education is a matter about which I always feel a bit confused, though I have been teaching for well-nigh forty years. But the problems of communication of knowledge, the relation between pupil and the teacher is to me yet something mysterious. How does your pupil learn from you ? He perhaps tries to imitate you. Your example will act as a leaven which produces the necessary ferment, but the pupil must find himself in the sense that as he grows up from boyhood or from

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childhood through adolescence into manhood, he should be able to utilise all the elements that the society provides for his development.

“And here, there are different ideas. I personally feel that in such matters, as in all matters, process of giving as much freedom as possible is perhaps the best thing to do in the long run. You have talked about machines : now, by suitably coupling the influence with the result by means of a feed-back mechanism you can make the machine almost simulate a conscious behaviour ; your missile may follow the enemy through his intricate military evolutions or your automation in the factory may regulate supply of raw materials and the same time test the quality of the products that are ultimately produced. It is something remarkable. But in all such cases, if one thinks a little, best results are always obtained when the machines are so conceived as to allow maximum amount of freedom.”

During the course of his professorship, Satyen wrote several letters to Albert Einstein.

“From 1916, Einstein remained largely busy setting up an all-inclusive explanation of energy in all scientific phenomena, including those of electric, magnetic and gravitational fields.”¹

¹ Some Eminent Indian Scientists—Jagjit Singh, p. 48.

HIS VERSATILITY

Bose was aware of this from hints that Einstein sent in his letters. Satyen asked permission from the great scientist to translate his work on Relativity, to which Einstein agreed.

The Bose-translation was out long before W. Perret and G. B. Jeffrey's translations in English. It was published abroad by Methuen & Co., under the title of, *The Principle of Relativity*.

Teaching, researching and translating were Bose's great delight. He translated *Die Grundlage der allgemeinen Relativitätstheorie*, and for the first time in India taught the theory. It is really uncanny, how Bose and Saha had the sense to select this important matter, and teach it to others.

"It is on record that when Einstein's General Theory of Relativity was experimentally verified by the famous solar eclipse in March 1919, the only two scientists who could throw any light on it to the *Calcutta Statesman* were Satyen Bose and Meghnad Saha. The *Statesman* carried the interview by these two scientists."²

Jointly, with M. N. Saha, Satyen Bose published a scientific paper on the influence of the Finite Volume of Molecules on the Equation of State. This was used

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in the British Journal, *Philosophical Magazine*, then under the editorship of the physicist Sir Oliver Lodge, in 1917.

The field theory had tested Bose's mettle. It was a subject that would attract any good mathematician, for its 'logical' and 'aesthetic' note of simplicity in its idea. Bose's early work on the field theory was not approved by Einstein. But this did not discourage Bose. He went on doing the research alone. His first paper on 'Statistics' had been acclaimed by Albert Einstein as a "masterly advance".

"The field theory seems to be Einstein's special work," said Saha one evening.

"It is—and I'm leaving it alone—for now," Bose replied.

Already his routine work programme was a crowded one. There were notes to prepare for his classes. Experiment to do, and a series of brilliant papers to write—so much more had to be done to advance the cause of Indian science.

From Relativity, to Stress-equations of Equilibrium, to works, On the Horpolhode, and even the quantum theory. Satyen Bose's versatility was remarkable. He had a way about him in making things clear that were of

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a complex nature. Let us read how he went about explaining things, in his own words. This is a short example from Bose's talk on The Classical Determinism and the Quantum Theory :

"I would like to present before you certain aspects of modern Physics and draw your attention to the profound changes in the principle of scientific explanation of natural phenomena brought about by the quantum theory. The last fifty years record remarkable discoveries. I need only mention the electron and the neutron, X-rays and Radio-activity to remind you of the increase of our knowledge. Our equipment has gained in power range and accuracy. We possess powerful telescopes to scan the furthest corners of the universe, also precise and delicate instruments to probe into the interior of the atoms and molecules. The alchemists' dream of transmutation has become a reality.

"Atoms are now disintegrated and synthesised. X-ray reveals invisible worlds and wireless links up the furthest ends of the earth with possibility of immediate inter-communication. These discoveries have their repercussions in the realm of ideas. Fifty years ago the belief in causality and determination was absolute. Today physicists have gained knowledge but lost their faith.

"To understand properly the significance of such a profound change it will be necessary to discuss briefly

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how it will come about. Classical Physics had begun with the study of astronomy. With his laws of gravitation and his dynamics Newton had explained planetary motion. Subsequent study has shown astronomical prediction to be possible and sure. The atomic theory had in the mean time gained universal acceptance; since matter had resolved into a conglomeration of particles, the ideal scheme was to explain all phenomena in terms of their motions and interactions. It was only necessary to set up a proper set of equations, and to take account of all possible mutual interactions. If the mass, position, and velocity of all the particles were known at any instant, these equations would theoretically enable the physicist to predict the position and motion of every particle at any other subsequent moment."

On the other side of the scientist, was Satyen Bose, the man. He was feeling-hearted and controlled a strong sentiment about democracy and individual freedom. He was undoubtedly a product of the very best that was in evidence in this country. Pronouncements may be easily made, but let us hear what famous author, Suniti Kumar Chatterji, has to say about Bose :

"I can recall another incident which is not known to the outside public, which demonstrated Satyendra Nath's courage and *sang froid*. A very well-known revolutionary worker in British times fighting for the freedom

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of India was the late Abani Mukherjee, a friend of mine and we were neighbours in Calcutta for a good many years. He was a participant in a move to import arms from America into Bengal during the First World War, and he went out of India to meet the ship which was bringing these arms to India. The arrangements failed and he was arrested, and after that we were told, he was condemned to death after a summary trial. While waiting for his execution at Singapore, he managed to make his 'escape to Sumatra, and he lived incognito for some years in Sumatra and Java working as a cooly in rubber plantations.

“Nevertheless, shortly after my return to India towards the end of 1922, I found that he had smuggled himself in a German ship into the Indian Soil, and the first person he came to see in the darkness of the night was myself—he was accompanied by a German sailor. I did not know what to do, because he had a price on his head, and if the British C.I.D. got any inkling of his presence it would mean certain death in the gallows for him.

“I had to take a few friends in confidence and Satyendra Nath was one of them. Abani Mukherjee stayed in Calcutta - he went underground, but he managed to meet his own brothers who helped him.

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The police did not have any idea of his coming to India till at the last moment.

“From Berlin I got a letter from him telling me of his financial straits. His brothers wanted to send him some money, and Satyendra Nath who was going to Germany once again readily undertook to hand over this money in Berlin to Abani Mukherjee. This he was able to do. All these show his innate sympathy for the fighters for the Nation’s freedom ; and the coolness and quiet courage with which he took the whole affair made a profound impression on me.”

In all affairs he was a man of tradition, and directly or indirectly concerned himself with the problems of day-to-day living as well. He could play on the *Esraj*, and was known to have spent many hours entertaining his friends—or soothing his muse at other times.

Work went on, however, and in 1920, once again in collaboration with Meghnad Saha, he published their paper on the Deduction of Rydberg’s Law from the Quantum Theory of Spectral Emission.

In 1921 when the Dacca University was founded, Satyen Bose joined as a lecturer and then as a Reader.

He wrote to Einstein, sending him a paper that had been ignored by the *British Journal of Physics*.

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“Einstein immediately saw the importance of it and published it in his *German Journal of Physics*, the most important academic journal in the world of Physics, with an introduction of his own in which he praised the brilliant method followed by Bose to arrive at the results.”³

In 1924, the statistical laws devised by Bose alone had been accepted. The later work with Einstein would be acclaimed instead. It is enough to say that the word **BOSONS** were named after Satyen Bose. Just as Fermion particles are named after Enrico Fermi.

Bosons, it is said, have found a new application in the science of molecular and microbiology.

CHAPTER TEN

A DREAM COME TRUE

The meanings of whatever Sir Ashutosh might have said were never ambiguous. He was a small man of burly outlook, with an exceedingly large heart and correspondingly larger ideas. But that afternoon, as he faced the lecturers of his University College of Science, and among them, Satyen Bose, "the youngest of the group and its *enfant terrible*"—the air was charged with discomfort.

"I propose," began Ashutosh Mukherjee, "to include additional subjects for teaching in the Applied Mathematics department."

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No one said a word, but impatiently shifted about. They all knew, as perhaps Ashutosh himself, that the present staff-strength was not geared to take on an extra load. Comparatively little was said by way of objection from the other members of the council ; till the gathering clouds of darkness fused within Satyendra Nath Bose, who rose and thundered that it was an 'impossibility.'

According to the reminiscences of D. M. Bose : "This standpoint Satyendranath maintained firmly in the face of some loud scolding from Sir Ashutosh ; we sat breathless watching this encounter between David and Goliath. In this instance, however, Goliath was a great hearted giant who could appreciate the intrinsic merits of some who had the courage to disagree with him."

Things went on at the Physics Department of the Science College, with a remote but all too real problem. There were too many able scientists milling together, in discomfort, no proper laboratory accommodations, and inadequate technical resources. The apparatus too was not enough—for them all. "Consequently a certain amount of heat was generated." The situation became unbearable.

"I'm going abroad," said Meghnad Saha, adding : "As soon as I can manage it."

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Satyen Bose, however, was the first physicist to migrate. He went to the Dacca University. "He loved Calcutta, but the readership in Physics at Dacca was more lucrative. Someone has hinted that he should have been other-worldly enough, not to have left the lower paid lectureship in Calcutta. This masochistic tradition in eastern morality is now fast disappearing."*

At the Dacca University Satyen built up the department of workshop for construction of apparatus used in his X-ray studies. Gradually he plunged himself into many fields of endeavour, and if ever there was a man who enjoyed life, it was Bose. He even had the time on his hands to read Suniti Kumar Chatterji's proofs on "the Origin and Development of the Bengali Language." Mr. Chatterji has recalled: "he made some very pertinent suggestions, which I was glad to incorporate in my book and as far as I remember I gratefully made a reference to this in the introduction of my book."

While in Dacca he made many friends among musicians and singers. He was an accomplished *Esraj* player as mentioned earlier; and in this respect he was following in the footsteps of his *Guru* (Einstein), who could play on the piano.

The Dacca University was an imposing building. It had large class-rooms, polished corridors, and a very

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open courtyard. But its most enchanting feature was, perhaps, the whole wide expanse of the countryside. Located in one of the finest surroundings, visitors to the University were many.

This made a great change of scene for Bose, from life at the Calcutta University where he had been working at full pressure. Here he felt more at ease somehow, and for a long while Satyen could stay at his desk, writing, re-writing, and destroying reams of white paper.

Dr. B. Mukherji, while on duties at the Dacca Mitford Medical School, had the opportunity of meeting Professor Satyen Bose at his Dacca house. He tells us that Bose was so friendly, he could keep people interested for hours with his "conversation punctuated with various anecdotes and stories."

Dr. Mukherji remembers those days :

"One evening while staying in his room in Dacca, I noticed a bambo flute in one corner of his room and asked him about its owner. I never expected that such a grave and sombre-looking erudite scholar with a profusion of unkempt hair on his head and a pair of thick-rimmed glasses on his nose, would have interest in music and that, he himself would be a player of the flute. Many people, I imagine, do not know that Professor Bose had at one time been a flute player and had also

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taken considerable interest in the art and if I may say so, in the Science of Music. On talking to him one would get quite a pleasant surprise to find that he not only knew the intricacies and nuances of various classical *Ragas* and *Raginis* but also had a fair acquaintance with music of the Rabindranath style. Much later when I was in Lucknow, I used to visit one of his school-day friends, late Professor Dhurjati Prasad Mukherji, and had heard from him many anecdotes of his school and college days. He told me about the deep interest of Professor Bose in Indian Music. While Professor Mukherji was writing his well-known book on Indian Music, he received quite a lot of criticism and suggestions from his friend, Professor Bose. Professor Mukherji used to say, not with any sense of mutual admiration for each other, that if Professor Bose took to music as his life's career, he would have become a master musicologist. Professor Bose apparently gave evidence to him of an analytical mind which could identify and characterise the fine differences in tone and modulation of different styles of Indian Music. He further was gifted with a discriminating ear which helped him to appreciate the notes and inter-notes, the rhythm and the cadences of Indian Music."

On the 4th June, 1924, Satyendra Nath Bose wrote to Albert Einstein.

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“Respected Sir, I have ventured to send you the accompanying article for your perusal and opinion. I am anxious to know what you think of it. You will see that (I have tried to deduce the co-efficient $8\pi V^2/C^3$ in Planck’s Law independent of the classical electrodynamics) only assuming that the ultimate elementary regions in the phase-space has the content η^3 . I do not know sufficient German to translate the paper. If you think the paper worth publication, I shall be grateful if you arrange for its publication in *Zeitschrift für Physik*. Though a complete stranger to you, I do not feel an hesitation in making such a request. Because we are all your pupils though profiting only by your teachings through your writings. I do not know whether you still remember that somebody from Calcutta asked your permission to translate your papers on Relativity in English. You acceded to the request. The book has since been published. I was the one who translated your paper on Generalised Relativity.

Yours faithfully,

S. N. Bose

“If you go out of the country Satyen, try for a doctorate from a British University. It would help you out here,” said a friend.

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Bose did not care for a mere Ph.D. from a British University. Yet, in the years ahead many students would work under him to get their Ph.D's, including one in Botany.

Prof. Bose had an "encyclopaedic" mind. He read French novels in the original, a several scientific journals and *Nouvelle Observateur*.

"Why do you read so much ?" he was once asked.

"Why do you eat so much ?" he replied calmly.

The story goes that one day after his classes at the Dacca University, a curious thing happened—a student was seen waiting for him outside his apartment. The post-graduate youth stood firmly rooted as Bose came up to him.

"What do you want ?" Satyendra Nath asked.

The young man lowered his head.

"Tell me, is something wrong ?" added Satyen, putting his arm on the boy's shoulder, and taking him into the room.

"I've come to tell you, I will not be able to complete my studies—my family needs my help."

Bose nodded. He asked the boy to leave his notebooks with him for the night. "See me in the morning tomorrow."

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The next morning Prof. Bose astonished the youth. He told him to go to his classes. “After all, you have only a year to finish your work. I will do what I can for your family. Remember, this is between us—and it must remain that way.”

No one knows what happened next—for Satyen never spoke about it again.

Things were falling into place. The pattern of his eventual success was shaping out. The Dacca University gave him a scholarship for two years to study in Europe. This was the big moment of his career. It was followed by things running smoothly all the way up to Madame Curie’s portals.

“You must learn French,” Madame Curie told him.

Satyen had known French for the last fifteen years. But he took this as an opportunity to see Paris, and brush up on his French. So, he promised to return to her in six months time. His work with Madame Curie was a great success. She was greatly impressed by his genius and marvelled at the way he could simplify the most intricate problems in Physics.

While in Paris, at 17 Rue du Sommerand, Satyen Bose wrote to Einstein on the 20th October, 1942.

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Dear Master,

My heart-felt gratitude for taking the trouble of translating the paper yourself and publishing it. I just saw it in print before I left India. I have also sent you about the middle of June, a second paper entitled "Thermal Equilibrium in the Radiation field in presence of matter."

I am rather anxious to know your opinion about it, as I think it to be rather important. I do not know whether it will be possible also to have this paper published in *Zeit. für Physik*.

I have been granted study leave from my University for 2 years. I have arrived just a few weeks ago in Paris. I do not know, whether it will be possible for me to work under you in Germany. I shall be glad, however, if you grant me the permission to work under you, for it will mean for me realisation of a long-cherished hope.

I shall wait for your decision as well as your opinion of my second paper here in Paris.

If the 2nd paper has not reached you by any chance, please let me know. I shall send you the copy that I have with me.

With respects,

Yours sincerely,
S. N. Bose (Prof.)

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This letter to the great master proved an enormous success to Bose's career. On the merits of this correspondence alone, Einstein, invited Satyen Bose to work with him the following year.

“You cannot imagine how thrilled I was. For days after that invitation arrived I spoke about it to everyone I came across. Here, indeed, was a dream come true”, he told a close friend.

For those remaining days in France, Satyen worked with Langevin, and in the private laboratory of de Broglie.

Satyendra Nath wrote home a letter to his father : “I feel the long road is widening, and avenues are at last opening up to methere is so much to learn over here No one has time to waste -it's all work, work, and more work.....”

Satyen Bose ought to have been the last man to have stressed on the importance of work, for he drove himself on tirelessly and worked into many fields of endeavour, Even the life sciences were of interest to him. Dr. B. Mukherji quite surprised one when he said :

“Many of his students, colleagues and co-workers are not probably aware of Professor Bose's deep interest in the¹ Life Sciences. It is usually not expected of a person with such deep interest in physical sciences to

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have a biologically-oriented mind and a refreshing outlook on life processes. In connection with my own activities in the field of drug research, I had often casually discussed some of my problems with him and I returned always benefited as a result of such discussion. In the field of synthetic amoebicidal drugs, Professor Bose had, at least on two occasions, given me ideas regarding the possible correlation between *chemical structure and biological activity* in the emetine derivatives which proved to be a very useful hint to some of my co-workers. Much before the era of Molecular Biology, Prof. Bose had the forward-looking view-point which enabled him to think of Life Processes as a function of the cellular units and predicted that if I wished to understand the *nature of drug action*, I should have to go more deeply into the phenomena of cellular absorption, diffusion, permeability, electrical charge at the cell surface, etc., and still later, into the possibility of interaction of a chemical agent with the inner components of the cell, as distinguished from their action on organs or organ systems as a whole. At that time our conception of the DNA-RNA systems, gene, ribosome, mitochondria, etc., were not clearly defined.....”

CHAPTER ELEVEN

BOSE-EINSTEIN STATISTICS

It is not possible here to give an explanation of Prof. Bose's work ; or for that matter the famous Bose-Einstein Statistics. Nevertheless, some phases of its importance may be shown. It is a statistical system which describes the behaviour of elementary particles. It is said that all such particles are governed by either Bose-Einstein Statistics or by those of Fermi-Dirac. The two are complementary.

When Satyendra Nath Bose was alive, one of his students asked him if his theoretical work on that subject, had ever become clearer in scientific investigations.

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“It has helped in explaining the peculiar behaviour of liquid helium at a temperature approaching absolute zero. Furthermore,” went on Satyen, “it has been used in the development of lasers.”

“Bose’s paper covering only 4 pages, is a model of presentation of a new idea succinct and clear alike—from which dispensable erudition is wholly absent. In this sense, it represented his own nature.” *

To understand the accurate radiation law, is to remember that Bose’s correction of the Maxwell-Boltzmann statistics, showed no distinction between the individual photons as Maxwell and Boltzmann proved in the case of gas molecules.

Jagjit Singh, in his book, ‘Some Eminent Indian Scientists’ tries to explain Bose’s statistics with the analogy of three guests, H. B. and C, and the two rooms in which to accommodate them. The result being $2 \times 2 \times 2 = 8$ different ways of accommodating three guests.

Mr. Singh goes on to say, finally: “Now the Maxwell-Boltzmann—statistical technique is essentially a calculation of the number of ways of assigning the various gas molecules (guests) to different cells (rooms) in space, even though this is no ordinary space, but an

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abstract one of a mathematician's imagination. When allowance is made for the basic *indistinguishability* of photons and electrons in contradistinction to the distinguishability of the gas molecules, the result is the new statistics of Bose and Einstein which, when applied to light photons, yields the correct radiation law.

“Further, if the guests had to observe in addition an anticrowding regulation—such as Pauli's principle prescribes for particles like electrons (though not for photons)—the result is what is called Fermi-Dirac statistics. There are thus only two statistical patterns that assemblies of elementary particles seem to follow, which is the basis for their present-day division into two categories—the *bosons* and the *fermions*.”

Bose's statistical law devised in 1924, when he was in his twenties, and the 'field' theory in his fifties, are two outstanding contributions he made to mathematical physics. In the thirty odd years between the two works, Satyen Bose studied in Chemistry, and other allied subjects—plunging into the fine arts as well, including languages and literature,

He could speak and demonstrate his ideas for hours with ease and comfort. The history of various languages were his forte. A story goes that Satyen Bose once asked his mother if she knew the origin of the Bengali langu-

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age, and when she confessed her ignorance of it, he was appalled.

“ It is our heritage —and we know nothing of its origin !” He exclaimed.

Later on in years when he made the friendship of Suniti Kumar Chatterji, and was told of the man’s great work in doing a book ‘On the Origin and Development of the Bengali Language’—excited Bose. He laboured almost three whole nights on the early chapters that were shown to him for comment.

“ I must present my friends with copies of your book,” he promised.

And it is said, he did just that.

Bose had much to say to Author Chatterji about his own views on his mother-tongue and English. It is an experience to hear Suniti Chatterji speak about it—and about Satyen himself :

“Satyendra Nath is convinced that the highest education in science in any country could and should be given through the medium of the mother-tongue. We fully agree with him, but at the same time we maintain that there is still a very great need to cultivate English as a link-language, to keep our unity in science, in

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culture, and in politics, with the other linguistic areas in a great polyglot nation like India. But I must have to add that he is not of a segregationist mentality—he is not like those who would remove English from the Indian scene ; and as a practical man of science he will go in for bilingualism in our higher scientific education, so long as the Indian scientists do not feel sure of themselves in their mother-tongues. But he would like the greatest support to be given to the mother-tongue. Herein every-body would agree with him. But he did not simply stop by just giving his verbal support to an idea and an ideal. He is the founder of a society in Bengal which seeks to propagate the study of science through the Bengali language, and this society publishes a journal which is certainly the most important of its kind in any Indian language.”

Fortunately, in 1926 Satyen Bose returned to the Dacca University. It was a time when the University had pressing need of him, and hoped by his very presence to inspire a generation of future Indian scientists. The ultimate purpose the university found in Bose is difficult to understand. It can be said, that Prof. Bose was one of its lighthouses in those early years. With his power of foresight, and force of character, Satyendra Nath had warned them, repeatedly, to look beyond the present day. It was always the future that hung in the balance.

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In his address, in 1929, at a symposium, Satyen fully expressed this theme :

“ You can always note evidence of history : how shortsighted ways of looking at things, though they have given quick results, may ultimately lead to disaster. It is not only an experience of Japan alone but practically of many countries and we hope that people will become wiser after such events and they will set up a common brotherhood of scientists of all countries who, naturally as they possess a more intimate knowledge of affairs, are able to guess better about the probable results that may follow any course of action. They may thus be able to guide all nations towards a new era, an era when the different nations, though they may be on different levels of material progress, yet ultimately will be united in one common bond of brotherhood and unity.”

Approaching the scientist, Satyen Bose, was not a problem. But it was not at the same time easy to draw him out. “When Jagjit Singh went to seek material from Bose for a biographical sketch, Bose told him it would be a waste of time. We have available only fragmentary accounts of Bose by a few of his friends.”

Here, however, was a full life, one that could well stand out with the best of them.

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Satyen Bose managed to avoid publicity and although he tried to espouse not being known, he blossomed instead, overnight, into an international figure. His life belonged to the nation. He would receive their due honours and deliberate attention. And all this was not far from that University in Dacca.

From 1926 to 1945 he served the University as a professor and guiding influence. But like all things this too would end. The call of the heartland grew stronger. He had to return to Calcutta again—and his day arrived when the Calcutta University offered him in late 1945 a Khaira professorship.

Satyen was destined to hold this position as Khaira professor for eleven years. His living room in Calcutta turned into a meeting place for many of his friends, co-workers and students.

Bookshelves stood in a corner of the room—well stocked, stacked and studied. Untidy (as it should be), and very impressive. In another nook of the room was his favourite writing desk, strewn with copies of French and German scientific journals.

On two sides of the opposite walls hung the portraits of Rabindranath Tagore and Albert Einstein. A smaller picture of his boyhood friends in the famous *adda* of the

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Hedua stood on his desk. A snap of professor Niren Roy, a friend and cousin, could be seen on the wall.

And there, too, he had his bed towards the two open windows. A copy of Rabindranath Tagore's *Viswa Parichaya*, that had been dedicated to him lay on the four-poster.

Rabindranath had written the following note to Bose (which has been put in English from the original Bengali by Dilip Bose, and which appeared in the author's article published in *Mainstream* of Republic Day, 1947) :

"I want to associate this book with your name. Needless to say, this book boasts of no such scientific value which is worthy of placing in your hands without any hesitation. Moreover, I feel a little shy least I have committed any mistake in a field where I am really a trespasser ; perhaps, it is also beneath your honour

"It is absolutely imperative for those who want to be educated to enter at least the outer precincts, if not the inner world, of science, In this work of making the first acquaintance with science, one can acknowledge the role of literature, and there is nothing wrong there. It is with that responsibility that I had set myself on this work.

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“But I have to answer for this not merely to literature but to science also. In the fidelity to facts and in the correct expression of it, science would not tolerate even the slightest deviation. I have been extremely careful on this, even with my limited capacity.

“Indeed, I have written out of a sense of duty and that I owe not merely to my students but to myself also. I had to educate myself also through this writing (of *Vishwa Parichaya*). The devotional attitude of a student may perhaps be of help when the students are engaged in their efforts to educate themselves,...

“In this last phase of my life, my mind is overwhelmed and almost benumbed by science’s new theories of nature —by the scientific *maya-ism*.”

CHAPTER TWELVE

IN THE MIDST OF INDEPENDENCE

Satyendra Nath Bose had been, from young, impelled by the dreams of trying to achieve a standard of Bengali that could be used profitably in the understanding of scientific terms. He was a great patriot—and friend of the five arts, and never hesitated to join any literary coterie.

One day he was informed of the powerful *Sabuj Patra*. It did not surprise him to learn that Pramatha Chaudhuri, nephew-in-law of Rabindranath Tagore, had started it. Pramatha was one of Bengal's brilliant literary

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scholars, and husband of Indira Devi Chaudhurani (daughter of Rabindranath's second elder brother, Satyendra Nath Tagore, I.C.S.).

Pramatha was a barrister and an English scholar as well. He cut a fine figure as a personality of the day, and further strengthened his name by being an admirer of French thought and culture.

At his residence "feasts of reason and flows of the soul" took place. Among his early members were a number of people who turned into celebrities in the India of the future. One of them was Satyen Bose.

"I enjoyed the Sunday soirees and had long made up my mind to be its constant member," wrote Bose.

His insights, his cool ruefully remarks were uncanny and accurate. He knew, even then, that sometime soon his countrymen would remember his efforts in wanting to promote his mother-tongue as a language, to popularise the world of science.

At The Dacca University with the help of a few colleagues, he started the Bengali journal, *Vigyan Parichaya*. It was intended to propagate scientific knowledge through Bengali. The journal found large audience in all parts of Bengal. Prof. Bose's idea was thus born – and would grow from one small plan to bigger schemes to be.

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"I have a dream," said Martin Luther King, the Negro-American civil rights leader. And his had been a great dream indeed.

So also had Satyen Bose. A dream that would be an ever growing affair. A dream that already inspires a generation of Bengali youth in reaching out for that distant star. And all because Prof. Bose had taken the first step to encourage his fellow men's interest in science.

Largely a man of many words, "he early lacked the spur of even scientific ambition that has lashed many inflamed geni into prodigies of concentrated effort in some one particular direction," said Jagjit Singh.

Walter Savage Landor, the English author, once said : "Children are what the mothers are ; no fondest father's fondest care can so fashion the infant's heart, or so shape the life."

This is so. For Satyen Bose himself felt that his mother had moulded his very nature. It was a rude shock indeed when in 1939 his dear mother passed away. Her death came to Satyen as a heart-rending experience. He had felt its impact so intensely it could not be explained in words.

Condolences arrived from all parts of the country. He took them in his stride. "My mother was a good

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woman." he told friends, "perhaps, the most honest mother I shall ever know."

Amodini Debi was dead. Surendra Nath Bose refused to talk to anyone. This tragedy could not be forgotten – not for a long time to come. And if time heals all wounds, the passing of Amodini Debi would be the exception.

John Quincy Adams' words might well have been those of Satyen Bose: "All that I am my mother made me."

In those few lines alone the great Indian scientists rested his weeping head. After all, Satyen Bose was 45 years old.

From milestone to milestone –the race for Prof. Bose had long begun. The Calcutta of yesterday was taking on a new look. Roads were cutting in, and large areas of wasteland were being used in the planning of a city. There were a number of shops that were not imagined twenty years ago. And for all its newness, *Goabagan* remained almost the same.

Satyen's wife, Ushabati Debi, as a dutiful wife will, devoted all her love and attention to her husband and her growing family.

The Bose's would have seven children in all. Two boys and five girls.* Their first born was Nilima, then

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Purnima, Joya, Sova, Rathindra Nath, Aparna and Ramindra Nath.

On meeting the eldest son, Rathindra Nath, I was deeply impressed by the youth's respect for all the works his father had achieved. He was of medium height, sharp features, careful in his speech, and his head shaven because of Prof. Bose's recent death.

“What is your opinion about your father ?”

“He was very affectionate –and paid great attention to us. Always there, willing to assist us in anything,” he replied calmly.

It strikes one as encouraging that Satyen Bose could have found so much time to be with his family, and also do so many other tasks. He was essentially a devoted father, and then a scientist.

Emotionally and intellectually he drove a firm hand in keeping both the home and his work in their proper place. He had always believed that for all things there was a time, and that life in its true sense was indestructible.

“ We are thus in a position to say that, in contradiction to what we thought before, in the social sciences we may also study from the same scientific point of view, thereby meaning that once we have devised a method of measuring certain things, we can always subject all our

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results to the same statistical treatment as in the case of observations of material phenomena," said Prof. Bose.

And by now, the years had turned dignified, and there was no low percipient thought in the minds of common folk. Temperamentally Prof. Bose was old-fashioned and it helped him to be this way. He had a sense of tradition, of continuity –and always tried to help others along this steady path.

Indian independence was at hand. The British had come to terms with our leaders and were working out the Constitution.

"The two-nations theory of Mr. Jinnah had found political expression. While Congress could block any solution by the British short of complete self-Government, the League could block, if it wished, any solution acceptable to Congress short of partition," wrote Percival Spear in his *History of India*.

The fate of India lay in the hands of five great men. First came the Mahatma, next Jawaharlal Nehru, followed by Muhammed Ali Jinnah, Maulana Azad and Mountbatten. When the moment of independence arrived, Nehru addressed the Constituent Assembly a little before midnight on 14 August, 1947 :

"Long years ago we made a tryst with destiny, and now the time comes when we shall redeem our pledge,

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not wholly or in full measure, but very substantially. At the stroke of the midnight hour, when the world sleeps, India will awake to life and freedom. A moment comes, which comes but rarely in history, when we step out from the old to the new, when an age ends, and when the soul of a nation, long suppressed, finds utterance. It is fitting at this solemn moment we take the pledge of dedication to the service of India and her people and to the still larger cause of humanity."

And so fell the inevitable lot upon India –and she was at last a free nation of one people indiscriminate of caste or creed. Many were diverted by this forceful event –only Satyen Bose remained the silent patriot he had always been.

"Now we will indeed forge ahead," he is remembered to have said. With that, Prof. Bose went back to his books and serious studies.

The Khaira Professor of the Calcutta University turned ever more dynamic in his classes. He seemed to radiate a new-found personality—as if, the very fact of India's independence had somehow triggered off a hidden God within him.

For ten years Satyendra Nath was destined to be with the Calcutta University. Ten years of the most precise and direct teaching he was ever known to have given.

CHAPTER THIRTEEN

HIS END OF THE JOURNEY

At no point in his life did Satyen Bose give evidence of irresponsibility. He did not take easily to passivism, but endured, if need arose, the hardest privations. Prof. Bose was never dull in company or showed signs of suffering even if he did so in his quiet moments.

As Chairman of the National Institute of Sciences, Prof. Bose kept to a tight, often difficult schedule. He took his appointment in 1948 and held it for two years. Subsequent happenings in his life led to deeper and deeper involvements. His last scientific paper at the

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time, on an Integral Equation associated with the Equation for Hydrogen Atom, was published in 1945.

In the years between, he and R. K. Dutta, were doing their own joint research. In 1950 the Journal Scientific and Industrial Research, published their paper, Extraction of Germanium from Sphalerite collected from Nepal—Part II.

1951 was the year when he went to Paris to attend an important UNESCO committee meeting. The following year he was made a Member of Parliament, in the Rajya Sabha. This post he held till 1958.

In fact, Satyen Bose, one can reasonably assume, was more evident now as a name abroad than before. It was no surprise when in 1958 he was made Fellow of the Royal Society.

The India Government was not long in taking note of this promising son of India. In a dramatic letter she told him of the Padma Vibhushan award. For Prof. Bose this meant more to him than anything he strove for. It also signified a trip to the capital.

There is a saying, when it rains it pours. For Satyen Bose it was pouring all right. 1958 was one in which his name and fame spread all over the nation.

This year he was made a National Professor !

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Honours never ceased to be bestowed upon him, and one that predominantly brought him to the forefront was his term as Vice-Chancellor of Vishwabharati University, Santiniketan.

This period had also taken its toll and Prof. Bose with failing eyesight still refused to relax his pace of work, or to do his duty which he considered to be all important.

He had been the recipient of the Meghnad Saha Memorial Gold Medal ; and from several Universities he had received Hon. D. Sc. degrees. To a man of such distinction it was only proper that students would come to him for advice.

“If anything is not clear to you go to the masters. Lesser authors cleverly by-pass the difficult points,” he would say.

Satyendra Nath Bose was a “Dabbler”, but a very beloved dilettante in many fields. One of his great-grand children recall the times when Prof. Bose would send for the cook and order him to prepare a special “chutney” or “achar,” the recipe of which he had himself prepared from ancient books he had read—sometimes concocting his own.

At home he did less work on his papers, but would love the Esraj ; and the people who came by to see him.

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He had become an institution of sorts. He was the country's grand old man. But in his heart, Bose was always young, ever fresh and constantly scintillating.

His eyes would light up each time someone tried to put him a problem, or ask him a question.

“What about your personal belief—which faith do you have more regard for?”

“Of all human beings ever born, I believe I revere Gautam Buddha most,” he has said.

The time had arrived, he felt, when something now could be done about Einstein's field theory. There was a time in the past when he had left it alone—it had been the masters preserve. But Einstein had finished with it—his ingenuity at an end. Prof. Bose tried to solve the field Equations. He succeeded in the first part on the equations of connection.

During 1953-55, Satyen Bose produced a series of excellent papers after what may be considered a *tour de force* with ideas and concepts.

Old age, on the other hand, was catching up with him. He suddenly realised that his output was slowing down. He no more could produce the same amount of work as he did in his early days. Man has his limitations,

and the stalwarts are no exception –and Bose had arrived on the threshold of his.

There were those pains in the back that came and went, more frequently. The headaches that seemed to keep being there most of the time. Suddenly he was beset by maladies after maladies.

“I’m all right,” he insisted, “there’s nothing the matter with me.”

He showed no signs of it –and no one really knew. But then he did sometimes make a curt reference or a casual remark of his ailments. It was sometimes not possible to know many things, because of his reticence and stoical disposition.

The gentle giant of Indian science was still the man who feared what C. P. Snow terms “slide-rule” scientists. He was determined to make science popular among his people. and even at this stage in his life, his Bengali scientific journal, *Bijnan Parichaya*, was well circulating in and around India.

The autumn of his life had dawned on him on a note of promise and praise. He had young men looking up to him wherever he went. He was always an honoured guest in any part of the country, and often he had been overwhelmed by the enormous adulation his people

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showed him. It appears that Satyen Bose had once again planned a whirlwind tour of Europe.

“ To see if it has changed at all,” he is remembered to have said.

But as the years weighed down upon him, the promise that differentiates the real from the imaginary takes a firm hold on Bose, and he knows that Europe he will not see again this lifetime.

He had always been reconciled to the fact of old age. It never worried him, nor did he care about it. The incompleteness that is life, to Prof. Bose, was just another green slope timbered with pines, leading down to the valley below.

Back in 1914, when the Indian Science of Congress had their first session, Satyen Bose recalled being there. It seemed so long ago—almost aeons since that day when he looked with pride at the man seated on the stage, who was none other than Sri Ashutosh Mukherji. Ashutosh had presided over that first session.

Thirty years later, Prof. S. N. Bose was elected President of the Indian Science Congress. Much had happened in the intervening years—and the man who had made his way up there, was one who deserved it. ‘Satyen, as President, made a great impact on the Congress and

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people came to know him as the scientist who went ahead "doing things" constructively.

At one of the sessions, Prof. Bose reminisced for a short while on the past. He mentioned the fact that in 1908 Ashutosh founded the Calcutta Mathematical Society a timely institute that had eventually won the approval and blessings of several people.

It was here, at the Calcutta Mathematical Society, that Prof. Cullis, N. R. Sen, B. M. Sen, B. B. Dutta and Satyen Bose had given stirring lectures. Foreign mathematicians, Bose said, had been made honorary members of the Society.

"In 1915 Prof. Young spoke on his research to the Society—I thought it was one of the finest talks I had heard," recalled Satyen.

Though Prof. Bose was no longer active as in the early days, he continued to be an inspiration and guide to many. That nothing goes unrewarded was a saying which had to come true. Within the sphere of his own colourful life, Bose woke up one morning to be told of how his countrymen were planning to do him homage some day soon.

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There was a rush to meet the deadline on all fronts. A committee was formed, and several of India's leading figures topped the list. In Bengal, the unanimous decision was for a penportrait in leading newspapers and magazines. The Radio people decided on putting the news over All India Radio. By his mere cogency of reason, Prof. Bose won over several obstacles – and finally took by storm the entire nation.

Satyen Bose was thereafter told of every move of the committee being made for the success of the event. No one shirked the drudgery of the long hours of planning, consultation, and preparation.

On the day of the celebration Prof. Bose said a few words that were moving and memorable, and all those who were fortunate enough to be there that evening were touchingly impressed.

CHAPTER FOURTEEN

FORMULA TO SUCCESS

The life of Satyen Bose was without doubt a great success. He has endured the test of public opinion, and is on an international scale, a celebrity. The formula to his achievement can now be told. It has been durable enough to survive the stressful circumstances of life.

Simple as it may seem, it has brought him and many others like him, the kind of acclaim most men only dream of. But Prof. Bose was, perhaps, unaware of the fact that he had used a formula—and properly—to reach his goals.

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Under certain impulses, some men function. The soothing hand of fate often intervenes—and it is done, consciously, or without thought. But men are not really the puppets they are made out to believe they are. And you can control your destiny.

Satyen Bose used every one of those nine basic factors that evolve towards success—INTEREST, ENTHUSIASM, DETERMINATION, PERSEVERANCE, TENACITY, INDUSTRY, COURAGE, HUMILITY, and CO-OPERATION.

The learning of science was never enough for Satyen Bose. He had a deep, personal INTEREST in the subject. This alone was enough to start him on the road to greatness. It was interest in science that made him study German and French. Interest again helped him to receive a first class first in his M.Sc,

But interest without ENTHUSIASM wo'nt do. The cornerstone to the world's greatest accomplishments has been enthusiasm. There would be no genius if they lacked their share of this quality. Bose had his in abundance. He used it to learn languages in order that he could translate foreign scientific papers.

Another factor that is of vital importance is DETERMINATION. The will to win must first be there. , Determination is nothing else, but the will to win. Satyen Bose was aware of this. He never despaired, not even

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when Albert Einstein, once, rejected one of his theories. Regardless of Einstein's opinion, Bose went on doing his research. And was, eventually, proved correct.

Does PERSEVERANCE have a play in the make-up of success? It certainly has. The ability to drive on in spite of the rough goings. It was all not smooth sailing for Satyen – he, like anyone else, also had his hard moments to contend with.

Some may feel that TENACITY and perseverance are one and the same thing, but it is not. Tenacity means to be able to cling on. To show a flair for 'sticking' it out, with a firm hold. Bose had tenacity. He could stand up to Sir Ashutosh Mukherjee and tell him what he thought without reservation.

And now we come to the factor—INDUSTRY. No man can achieve his laurels without hard work which is what industry means. Prof. Bose knew it too well, and he worked even harder each time he had a chance to. It was industry on his part, that brought him the goodwill of Einstein. Work made him popular, and won him many awards in life.

COURAGE, too, is just as important and meaningful. Courage of one's own convictions. Courage to do or die. Courage to face the consequences. Courage to admit

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you are wrong. Courage like Satyen's when He wrote that first letter to Einstein.

In the lives of great men you will find many instances of HUMILITY, which means to be humble. Prof. Bose was just that. He told a research-writer on his Biography, asking him questions would be a waste of time. He never put great importance to his own self, but he did respect men who towered above him.

Success is not only made up of the qualities you possess. Sometimes it goes out of yourself as well. And this is where CO-OPERATION comes in. It is relevant to the success of all accomplished men, that those around them should co-operate in some measure to their hopes and ambitions. Satyendra Nath Bose had the co-operation of co-workers, friends. and his family too. Co-operation leads to encouragement of the individual genius—and a man is helped along in his efforts, as Bose was.

National Professor Satyen Bose retired from Visva-bharati University in 1958. This was to be his very last appointment till his death on 4th February, 1958.

The monument to his name will always be what he had himself founded in 1948, the *Bangiya Bijnan Parishad* (Science Association of Bengal). It is a labour of his own-nursed from the first brick to what it is today, an imposing building.

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A strong nationalist, he once referred with great emotion to Jawaharlal Nehru. In politics, Satyen Bose was not a radical, nor was he ever active, as his friend Saha, the physicists had been. Although he was a member of the Rajya Sabha, he never went out of line in words or in deeds.

Bose was a man of awareness. He knew of the problems people faced, and had great sympathy for the plight of science students. Bose was ever prepared to devote his time to the interest of those who came to him.

Satyen loved cats.

He was frugal in his tastes. He could find relaxation in the small things in life—in books, and cigarettes, and flowers. It is said, that even at his age, his handwriting was so clear and neat it was always worth preserving.

In his reminiscences, D. M. Bose, writes of his meeting with Satyen: "Satyendranath looked at me with his large luminous eyes full of intelligence, with a slightly humorous cynical expression of his face, of a person who while deeply responsive to genuine human values, refused to be misled by 'making beliefs.'"

It is also known that Prof. Bose was working on the Theory of Numbers. He had a special fascination

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for the subject, and attributed his interest in it to one of his professors at the Presidency college.

He had several scientific papers from abroad sent to him—for that matter—his instructions were to pass on any new idea on the Theory of Numbers as well.

Then came a time when he received a paper on numbers written in very difficult Latin. Bose was not able to have it properly translated. He thought of a Jesuit priest at Saint Xavier's College—a fellow mathematician whom he had sometimes given a lift to in his car on the way from the Calcutta University.

The Jesuit, F. Goreux, Head of the Mathematics Dept. St. Xavier's College, accepted to take up the task, and after a few days was able to return it to Satyen explained in very clear language. Satyendra Nath was indeed grateful to the Roman Catholic priest.

“I knew him very casually,” replied Father Goreux. “But he had a keen sense of grappling with a subject—and being able to find a simple way to explain the most complex problems in science. I knew him between 1950–1958

As an examiner, Satyen Bose found the problem of passing judgement on the work of students to be more

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disturbing than his mathematical equations. He once said :

“And during the long years of my experience as an examiner we often felt that when there are more than one examiner it is very difficult to correlate the diverse judgements eliminating the personal equations in the process. In our University of Calcutta we had a peculiar rule : if two examiners differ, refer it to the third examiner ; and then, when the third examiner's results are different from both, take the mean. But you see how uncertain is the possibility of eliminating personal equations or personal prejudices in such cases in this way.

Prof. Bose was a scientist who believed in justice first, last and always. In his own life he had framed the image of a man who did good not for the sake of goodness, or its rewards, but because it was the right thing to do. There was never doubt in his decisions — for his mind dictated the rules he followed. And there are those still to testify of his deep and sincere honesty in all things. It was, perhaps, one of the reasons why he lived to be so old.

It is only fitting to be able, at this stage, to consider Prof. Bose as : the man responsible for Bengal's interest in the field of science. There is no coupling of Bose with any other scientist of this day, who had done as much as he had for this generation of Bengali youth.

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But sometime soon in the near future when children go out of doors, to the gardens and the grand parks of the city, they might see the bronze statue of Prof. Bose — and who knows, but more than one child may yet look at the tall figure — tug at the hem of his mother's sari and say : “I hope to be like him, mother !”

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